

Safe. Strong.
Styrodur®

BASF
We create chemistry

Perimeter Insulation with Styrodur® Hybrid



1. Long-standing Trust in Styrodur®

With Styrodur, BASF can draw on decades of experience in the XPS market: Since 1964, the company has been producing the green insulation material, which is set apart by its high quality, versatile applications, and robustness. Styrodur stands for technology “made in Germany” and for unique, constantly evolving work on approvals.

This is why Styrodur has convinced generations of architects, craftsmen, builders, and building material suppliers of these benefits:

Environmental advantages:

- Environmentally friendly due to CO₂ production process with air as cell gas
- Reduction of carbon dioxide (CO₂) emissions thanks to excellent insulation performance
- Free of harmful blowing agents
- Polymeric flame retardant

Quality and safety advantages:

- Technology “made in Germany”
- Most technical approvals on the market
- Proven since 1964
- Protects the building construction from external forces such as heat, cold, and humidity
- Comprehensive production control and quality monitoring, documented by CE marking KEYMARK and Q-sign
- Long-lasting: if correctly installed, Styrodur outlasts the life expectancy of the building construction

Structural-physical advantages:

- Excellent insulation properties
- High compressive strength
- Very low water absorption
- Resistance to aging and decay
- Fulfills all structural-physical and building construction requirements in Europe’s various climate conditions

Processing advantages:

- Low dead weight
- Simple and practical processing with suitable saws or hot-wire cutting equipment
- Can be installed in all weather conditions
- No dust hazardous to health during mechanical processing
- Extensive product range
- Most diverse potential applications

Economic advantages:

- Strong market presence
- Fast availability and reliable partnerships thanks to Europe-wide logistics with professional customer service via local distributors
- Reduction of energy costs for heating and cooling
- Quick amortisation of the insulation investment with rising energy costs
- Increases the life span and raises the value of the building

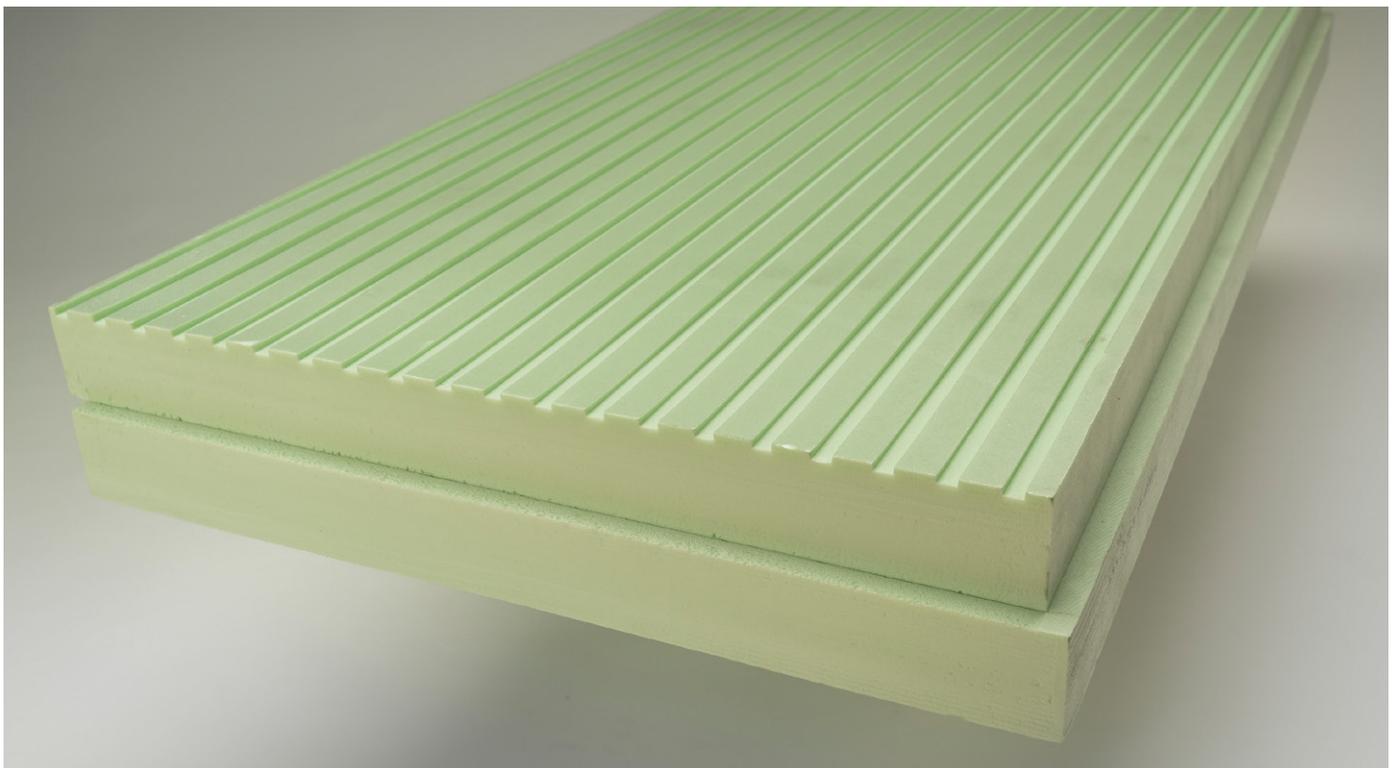


Fig. 1: Styrodur Hybrid board with longitudinal grooves on one face and shiplap edges.

2. Perimeter Insulation

The perimeter insulation comprises the exterior thermal insulation of building elements with ground contact, e.g. exterior basement walls (Fig. 2) and basement floors (Fig. 3). The distinguishing feature of perimeter insulation is that the thermal insulation layer is applied on the outside of the structural sealing.

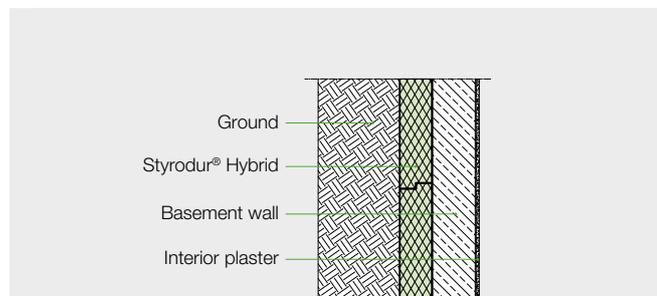


Fig. 2: Basement wall with exterior thermal insulation layer, adjacent to the ground.

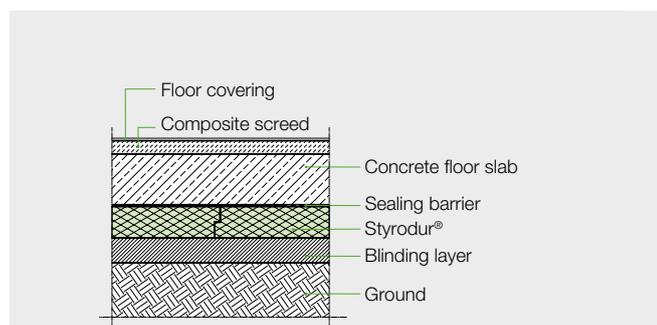


Fig. 3: Lower room barrier with bottom thermal insulation layer, adjacent to the ground.

When used for perimeter insulation, the exterior Styrodur thermal insulation has a water vapour diffusion function, as the water vapour diffusion resistance of the individual layers decreases towards the exterior. The thermal resistance of the individual layers increases from the interior to the exterior. An exterior thermal insulation layer is also advantageous in terms of protecting the exterior building elements of the basement from condensation. The insulated wall interior exhibits an increased surface temperature compared to a non-insulated building element, which contributes to more comfortable living conditions. The risk of condensation forming on the interior wall surface is low.

Perimeter insulation in areas with soil moisture and non-standing seepage water (above groundwater) according to standard and approval

DIN 4108-2 defines thermal insulation systems as perimeter insulation if the insulation boards are made of extruded polystyrene foam according to EN 13164, are installed as a single layer and not under building foundations, and if they are not

continuously immersed in groundwater. Perimeter insulation with Styrodur boards above groundwater level therefore constitutes a construction conforming to the standards. In compliance with the approval or construction type approval, Styrodur can be used as perimeter insulation on exterior basement walls with ground contact in single or double layers, and under static non-load-bearing building elements (basement floor slabs) in single, double, or triple layers. Styrodur Hybrid may be installed as perimeter insulation in a single layer (60–160 mm) in accordance with the construction type approval.

Perimeter insulation in areas with pressing water and standing seepage water (in groundwater) with general construction type approval

Styrodur has been approved for many years by the German Institute for Building Technology (DIBt) in Berlin for use as perimeter insulation in areas subject to long-term backwater or pressing water. Styrodur Hybrid may be immersed in groundwater up to a maximum of 3.50 m and installed in a single layer (60–160 mm) on the exterior basement wall in accordance with the general construction type approval.

Perimeter insulation reduces heat loss at building closures and also contributes towards a comfortable indoor climate in the basement area. The higher temperatures on the interior surfaces of walls and floors prevent condensation from forming in the interior, which helps to avoid the musty odour frequently encountered in basement areas. For the user, this provides the following advantages:

- The indoor climate in the basement/lower level is improved.
- The temperatures on the interior surface of the basement walls rise.
- Condensation on the inside of the basement walls and basement floor is prevented.
- The user gains additional interior space.
- The value of the building is increased sustainably.
- Thermal insulation saves energy costs.
- Insulation layers can be applied without thermal bridges.
- The exterior basement wall is protected.

Since the thermal insulation material used in perimeter insulation is extremely highly stressed by rainwater, earth pressure, and traffic loads, the materials are manufactured to meet the highest demands:

- High compressive strength
- Resistance to moisture
- Low thermal conductivity
- Rot-proof
- Good and durable thermal insulation properties

Styrodur Hybrid possesses these properties and is excellently suited for use as an insulation material in perimeter insulation.

3. Thermal Insulation Layer with Styrodur® Hybrid

On vertical surfaces, Styrodur Hybrid boards are butted tightly in a bond formation (Fig. 4). Boards with a shiplap are particularly suitable for preventing the formation of thermal bridges. They also protect the structure from mechanical stresses.

Installation:

In accordance with DIBt general construction type approval Z-23.33-2098 (Fig. 5), Styrodur Hybrid may be installed:

- In areas with soil moisture and non-standing seepage water (above groundwater) as well as
- In areas with pressing water and standing seepage water (in groundwater).

The total thickness of the thermal insulation layer on walls should be 60–160 mm.

In accordance with the general construction type approval (CTA), Styrodur Hybrid may be installed in a single layer in long-term or constantly pressing water up to an immersion depth of 3.5 m. Styrodur Hybrid must not be used under floor slabs.

When calculating the thermal insulation, the following application-specific rated value of thermal conductivity must be used for Styrodur Hybrid according to the installation situation:

- In areas with soil moisture and non-standing seepage water: 0.034 W/(m·K)
- In areas with pressing water and standing seepage water: 0.039 W/(m·K)
- Thickness is determined by the nominal thickness minus the groove depth of 5 mm

General information

During the Styrodur board extrusion process, a smooth compressed foam membrane is formed on the surface of the boards.

For a better adhesive bond with concrete, the surface must be profiled. Styrodur Hybrid has a surface that is mechanically machined on one side (longitudinal grooves), which ensures a full-surface adhesive bond between Styrodur Hybrid board and concrete when the concrete is placed. This prevents water from running down the rear side of the thermal insulation.



Fig 5: General construction type approval from DIBt, Berlin.



Fig. 4: Installation of Styrodur Hybrid on the inside of the formwork.

4. Advantages of Styrodur® Hybrid in Perimeter Insulation

There are many good reasons to use Styrodur Hybrid in perimeter insulation:

- High compressive strength.
- No need for additional protective layers.
- Installation depth according to earth pressure, up to a depth of 12 m.
- No deterioration of thermal conductivity since virtually no moisture absorption.
- Concreting in the formwork to a waterproof concrete wall is permitted by a general construction type approval.
- Processing advantages, as Styrodur Hybrid does not require the time-consuming subsequent step of being bonded to the entire surface of the exterior basement wall with bituminous sealing compound. This eliminates the need for large quantities of bituminous adhesives or sealing compounds.
- No special protective measures are needed in frost-prone areas.
- Non-cohesive soils do not require drainage.
- Simple processing. Only in groundwater is it necessary to seal the circumferential edges of the boards with suitable bituminous sealing compounds.
- Full-surface bonding of the Styrodur Hybrid boards to the waterproof concrete exterior basement wall secures against uplift. No additional measures to prevent uplift are necessary.

More information about Styrodur Hybrid is available on our website www.styrodur.com, where you will also find brochures and videos.

5. Perimeter Insulation in Areas with Soil Moisture and Non-standing Seepage Water (Above Groundwater)

Waterproofing

Walls reaching into the ground can be made of concrete, waterproof concrete, or plastered brickwork. Building elements that are permeable to water must be fitted with structural sealing in line with DIN 18533 "Waterproofing of elements in contact with soil". The implementation of such structural sealing measures depends on the level of moisture stress.

Perimeter insulation does not take the place of structural sealing. Only walls made of waterproof concrete may be insulated directly with Styrodur Hybrid without further pre-treatment. The following steps should be taken to ensure correct processing:

- When installing in front of the exterior formwork wall, the board must be inserted with the grooved side facing inwards and the foam membrane facing the formwork wall. The grooves must always run vertically.
- Styrodur Hybrid's shiplap design makes it very easy to lay with an exact fit without joints.
- The Styrodur Hybrid boards must be butted tightly to form a bond and lie flat on the substrate. Cross joints should be avoided.
- Styrodur Hybrid boards can also be fixed to the formwork wall using suitable PU foam at the corner points of the boards, for example.

When used in the absence of groundwater or long-term standing seepage water, the board edges can be bonded all around with a suitable PU foam to prevent concrete slurry from leaking through the joints. The Styrodur Hybrid boards must not be damaged when installing and removing the formwork, so the use of nails or similar tools should be avoided.

Styrodur Hybrid may not be used as floor slab insulation.

When the concrete is poured, the insulation boards are pressed against the outer formwork wall and are thus held in place. The grooved surface of the Styrodur Hybrid boards creates an excellent adhesive bond with the concrete. Styrodur Hybrid is easily cut to the right size to meet individual requirements using a saw, hot-wire cutting equipment, or other suitable tools.

6. Perimeter Insulation in Areas with Pressing Water and Standing Seepage Water (In Groundwater)

Waterproofing

The insulation layer must not impair the functionality of the structural sealing. The waterproof concrete exterior basement wall must perform the sealing function in accordance with the relevant codes and guidelines.

Sealing the joints

When used in groundwater or in the case of long-term standing seepage water, the side edges of the Styrodur Hybrid boards must be sealed all around with adhesive or an appropriate bituminous sealing compound to protect against water penetration (**Fig. 6**). The boards should then be positioned 2 to 3 cm apart and pushed in to form a good seal. The Styrodur Hybrid boards must be butted tightly to form a bond and lie flat on the substrate. Cross joints should be avoided. The ship-lap edges ensure a joint lock, which prevents the formation of thermal bridges.

Styrodur Hybrid may be immersed in groundwater up to a maximum of 3.50 m.

Processing the Styrodur Hybrid boards

The Styrodur Hybrid boards must be installed in front of the exterior formwork wall with the grooved side facing inwards and the foam membrane facing the formwork wall. The grooves must always run vertically (**Fig. 7**)

The insulation boards must be butted tightly to form a bond and lie flat on the substrate. Cross joints should be avoided. The shiplap edges ensure a joint lock, which prevents the formation of thermal bridges. When used in pressing water and where there is standing seepage water, each board side edge must be protected all around against water penetration.

This is achieved by coating the board edges with a suitable bituminous sealing compound, such as PCI PecimorDK. Moreover, the insulation boards must be positioned on a solid supporting surface (e.g. the projecting foundation).

The boards may only be installed as a single layer.

After the Styrodur Hybrid boards have been installed on the formwork, work can begin on laying the reinforcement. The holes for the formwork anchors must be prepared before the inner formwork can be put in place. In the case of system formwork, holes can easily be drilled through the Styrodur boards using appropriate drills. Subsequent steps should follow the guidelines and standards for concreting waterproof exterior basement walls.



Fig. 6: Sealing the board edges against pressing water.

Securing against uplift

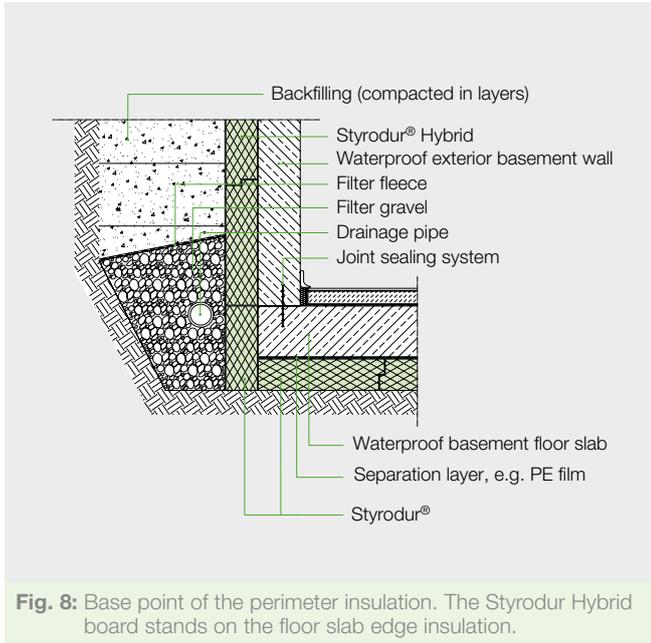
Full-surface bonding of the Styrodur Hybrid boards to the waterproof concrete exterior basement wall secures against uplift.



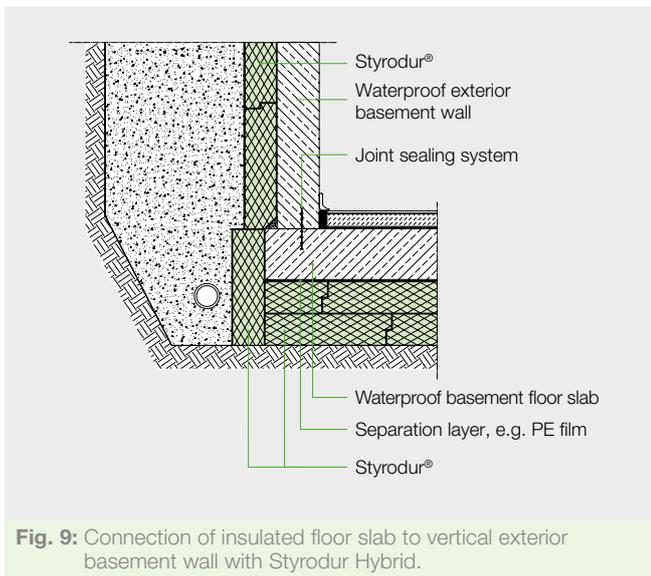
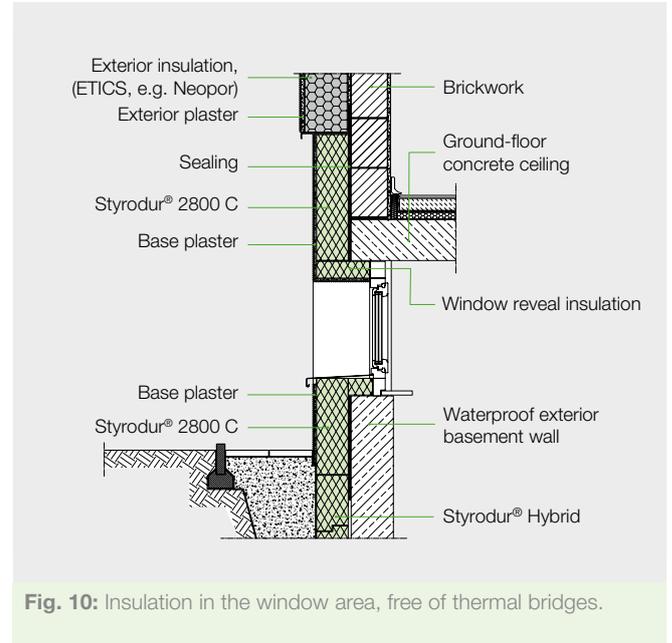
Fig. 7: Positioning the Styrodur Hybrid boards.

7. Connections and Finishes

At the base points (**Fig. 8 and 9**), such as the lower starting point of the perimeter insulation, the Styrodur boards must be positioned such that slipping off due to settlement over time is prevented.

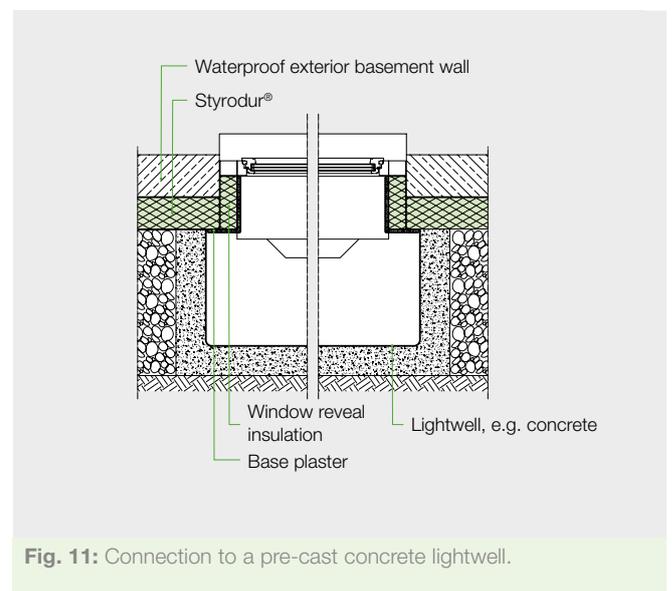


Near windows, lintels, and window frames, the thermal insulation is to be free of thermal bridges (**Fig. 10**).



Lightwells

In order to avoid thermal bridges, lightwells should be thermally separated from the building, which in turn allows a variation of the lightwell width. Lightwells can be made of pre-cast concrete parts (**Fig. 11**) or plastic.



Another good solution is to use lightwells fixed to the basement wall with screws through the insulation (Fig. 12).

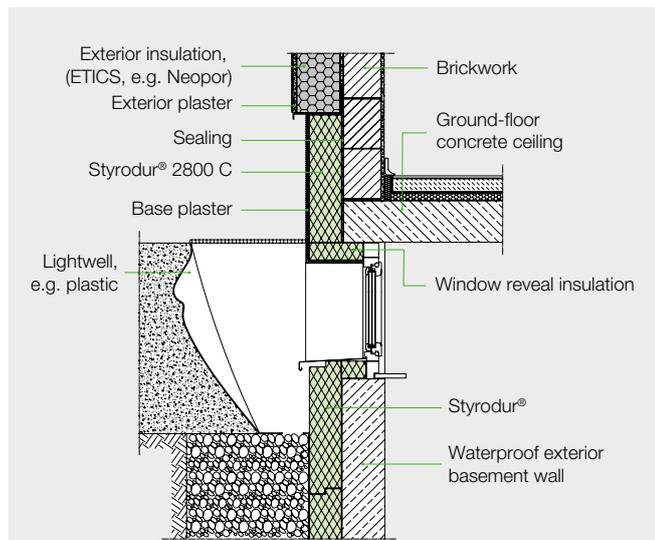


Fig. 12: Connection to a plastic lightwell, free of thermal bridges.



Fig. 13: Fitting a lightwell.

8. Base Insulation

Insulation is also necessary in the base area of the basement between the surface of the ground and the rising, thermally insulated brickwork or the external thermal insulation composite system (ETICS) (Fig. 14). Above ground level, Styrodur 2800 C with its thermally structured surface is used if the surface will be plastered.

In the base area and on the ground surface, the Styrodur boards must be protected from mechanical damage and UV radiation. Suitable measures should be taken to ensure that water cannot run behind the insulation layer. The rules concerning the termination of sealing barriers at the base of the building must be observed in accordance with the relevant codes and guidelines..

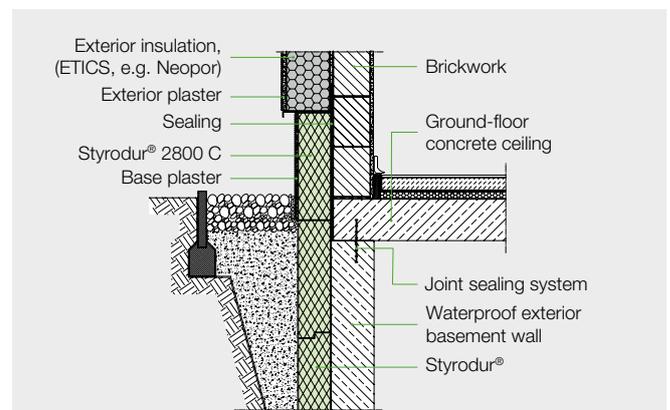


Fig. 14: Base area, perimeter insulation with external thermal insulation composite system (ETICS).

In the base area, the boards are preferably bonded across the full surface of the exterior wall with a construction adhesive or by means of the dot-bead method. Once the adhesive has cured, the Styrodur 2800 C boards are dowelled with four plate anchors per board (Fig. 15). The head diameter of the anchor must measure at least 60 mm. Styrodur boards without a thermally structured surface are not suitable for plastering (see Instructions for the installation and plastering of XPS at www.styrodur.com)..

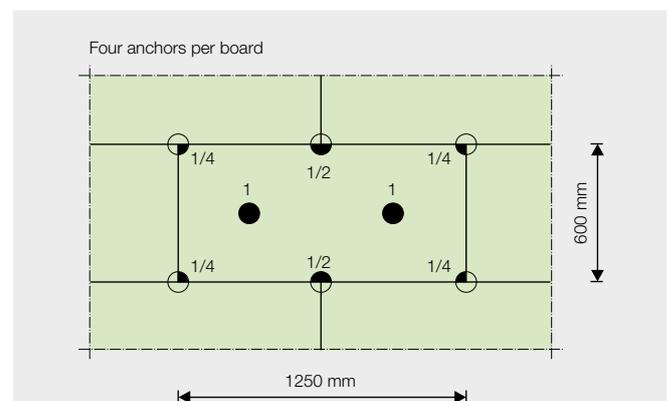


Fig. 15: Positioning and number of anchors (four anchors per board) for subsequent attachment of Styrodur boards in the base area (dimensions in mm).

9. Insulation of Strip Foundations

When constructing insulated strip foundations, Styrodur Hybrid boards can be positioned directly in the formwork and cast in concrete or used as permanent formwork (Fig. 16).

The strong adhesive bond between Styrodur Hybrid and concrete means that plastic anchors (plastic nails) are not required.



Fig. 16: Formwork with Styrodur Hybrid.

10. Drainage

Drainage is not normally required to protect the perimeter insulation. In the event of special soil conditions, such as a water-impermeable soil zone or a specific building location (a slope, for example), drainage measures to remove surface and seepage water are required. If this is the case, the relevant standards and trade regulations must be followed (Fig. 17).

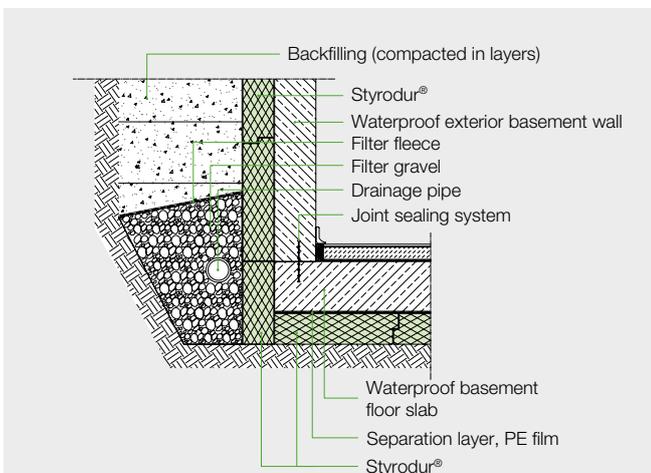


Fig. 17: Perimeter insulation structure, combined with drainage system.

11. Backfilling

When the excavation pit is properly backfilled, the Styrodur boards require no additional protective layers. Minor damage to the surface of the boards will not affect the functionality of the perimeter insulation. Care must be taken when backfilling to ensure that earth movements do not damage the insulation boards. The excavation pit should be backfilled (Fig. 18) in layers about 40 cm thick, which should then be compacted.



Fig. 18: Layered backfilling of the excavation pit and mechanical compacting

12. Technical Data for Styrodur® Hybrid

Properties	Unit	Designation code according to DIN EN 13164300	Hybrid SL	Hybrid S
Edge profile				
Surface			smooth, grooved	smooth, grooved
Dimensions	mm		2500 x 615	1265 x 615
Thickness	mm		120	100, 120, 140
Compressive strength at 10% deformation ²⁾	kPa	CS (10\Y)	300	300
Adhesive strength on concrete	kPa	TR 200	-	-
Dimensional stability 70°C; 90% r. h.	%	DS (70,90)	≤ 5 %	≤ 5 %
Deformation behaviour: load 40 kPa; 70°C	%	DLT (2)5	≤ 5 %	≤ 5 %
Linear coefficient of thermal expansion	mm/(m·K)	-	0,06	0,06
Longitudinal				
Transverse			0,06	0,06
Fire behaviour	Euroclass		E	E
Water absorption with long-term immersion	% by vol.	WL (T)	0,7	0,7
Water absorption in diffusion test	% by vol.	WL (V)	3	3
Water vapour diffusion resistance factor		MU	150 - 50	150 - 50
Water absorption after freeze-thaw cycle	% by vol.	FTCD	1	1
Application temperature limit	°C	-	75	75

Rated value of thermal conductivity for Styrodur Hybrid

Product type description	Insulation layer thickness ¹⁾	Rated value of thermal conductivity in the event of ²⁾	
		soil moisture and non-standing seepage water	pressing water and standing seepage water
		(mm)	(W/(m·K))
Styrodur Hybrid	100 < d ≤ 140	0,034	0,039

¹⁾ Thickness of the extruded foam board is determined by the nominal thickness minus the groove depth of 5 mm.

²⁾ λ = rated value of thermal conductivity according to DIBt approval in line with DIN 4108.

13. Information and General Technical Guidelines

- Styrodur should not be exposed to solar radiation for extended periods, particularly during summer months.
- If Styrodur is used under covers such as roofing sheets, films, or building protection mats, excessive heating could possibly occur during summer due to the absorption of sunlight, which might cause deformation of the Styrodur boards. Styrodur should not be exposed to temperatures above 70 degrees Celsius for long periods of time.
- Styrodur insulation boards must be permanently protected against UV radiation.
- Styrodur is not resistant to all substances (see the “Chemical Resistance” brochure on www.styrodur.com). The instructions of the adhesive manufacturer must be observed when selecting the adhesive.
- If using formwork oil, refer to the information provided by the manufacturer. Some oils can damage the surface of the boards if they come into direct contact with Styrodur.

Videos about Styrodur Hybrid

Our videos about the advantages of Styrodur Hybrid and how to process it provide additional information in a quick and memorable format. Simply click on the image or scan the QR code.

Please note, that the videos currently only exist in German language.



Click here or scan the QR code!

Processing Styrodur Hybrid



Click here or scan the QR code!

To find out more about our products, how to process them, and for technical information, visit www.styrodur.com.

Styrodur® – A Strong Product Line

With the Styrodur® product line, BASF offers the ideal insulation solution for almost every application.

Styrodur® 2800 C

The thermal insulation board with an embossed honeycomb pattern on both sides and smooth edges for applications in combination with concrete, plaster, and other top coats.

Styrodur® 3000 CS/SQ

The innovative multipurpose thermal insulation board with smooth surfaces and shiplap for almost all applications in structural and civil engineering and with uniform thermal conductivity across all board thicknesses.

Styrodur® 4000/5000 CS/SQ

The extremely compression-proof thermal insulation board with smooth surfaces and shiplap for applications that require maximum compressive strength.

Styrodur® 3000 BMB

The multipurpose thermal insulation board produced using renewable instead of fossil raw materials with the same technical properties as conventional Styrodur CS/SQ, which helps to save resources and reduce CO₂ emissions.

Styrodur® Hybrid

The thermal insulation board with longitudinal grooves on one side and a shiplap for use as perimeter insulation for concrete pouring with waterproof concrete exterior basement walls.

Up-to-date technical information is available on our website: www.styrodur.com



Important note

The information submitted in this publication is based on our current knowledge and experience and refers only to our product and its properties at the time of going to print. It does not imply any warranty or any legally binding assurance about the condition of our product. Attention must be paid to the requirements of specific applications, especially the physical and technological aspects of construction and building regulations. All mechanical drawings are basic outlines and have to be adapted to each application.

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